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A PRACTICAL APPROACH TO SOLVENT SUBSTITUTION

Many companies have been faced with rising manufacturing costs because they use chlorofluorocarbons (CFCs), 1,1,1-trichloroethane (commonly known as TCA or methyl chloroform), or other ozone-depleting substances (ODSs). Under the Clean Air Act, these chemicals have been taxed, and production of these chemicals will soon be prohibited.

The increasing costs and pending disappearance of ODSs from the solvent market is forcing many manufacturers and businesses to find alternative degreasing methods. Years ago, many companies switched to ODSs from halogenated solvents such as trichloroethylene (TCE), perchloroethylene (perc or tetrachloroethylene) and methylene chloride (dichloromethane) because the ODSs were safer to use. Many companies are now considering switching back to these well-known solvents because they are familiar, and to use them typically requires minimal equipment and/or process modifications.

BEFORE YOU SWITCH, YOU SHOULD:

- Know the range of options open to you
- Think carefully about employee exposures
- Evaluate total potential liabilities (e.g. CERCLA)

There are many new alternative cleaners and cleaning processes on the market with proven track records. There are nonsolvent methods of cleaning, strategies for preventing soiling, and ways of eliminating cleaning steps altogether. The *Office of Technical Assistance* is one source of free, confidential information about these. (See last page for contact information).

There are numerous and important health, safety and regulatory considerations for manufacturers who switch from using ODSs to other halogenated solvents. It is important to review the decision-making process that occurred when your firm originally started using an ODS. ODSs have often presented a reduced risk of liabilities for penalties or legal actions under environmental law. Companies should consider how they will be affecting their legal position in the case of harm or an accident if they now switch back to a chemical that they once stopped using because of its hazards.

Regulatory Considerations Depending on the amount of solvent your firm uses and what type of emissions are involved, you may be subject to more than one type of regulation. *At a minimum, you will be subject to:*

- **State and federal hazardous waste laws,** including laws which subject all generators of

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hazardous waste to permanent liability in case of contamination, even if the waste was disposed of in a proper manner. At the federal level these include the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or Superfund). EPA has delegated to most states the authority to conduct their own programs to prevent harm from hazardous waste, and state programs may be more restrictive than federal guidelines suggest. Check both federal and state regulations. It is your responsibility as a hazardous waste generator to identify your hazardous wastes, and comply with all of the many requirements for proper management of the waste, from cradle to grave. You must submit a notification form for any new hazardous waste you have not previously reported.

- **State and Federal Hazardous Materials Laws** The federal Hazardous Materials Transportation Act (HMTA) imposes placarding and labelling requirements on shippers of hazardous materials, and the federal Emergency Planning and Community Right to Know Act (EPCRA) requires the submission of information concerning the **presence on site** of hazardous materials, and the releases of listed substances from the facility. In addition, many states impose reporting requirements and mandate **reduction planning** for users of large quantities of toxic materials, sometimes including the payment of fees for such use.

- **Occupational Health and Safety Administration (OSHA) regulations** governing indoor air emissions and quality. These federal regulations set limits on employee exposure, and require the communication to employees of information about the hazards of using the chemical. Employees concerned about increased risk from a switch to a chemical that represents a safety or health hazard can ask for an OSHA inspection.

- **Air Quality Regulations** Massachusetts firms that begin using TCE, perc, or methylene chloride may become subject to air pollution regulations. Regulations likely to affect your firm include:

  - the requirement to obtain a written approval and/or meet certain design standards for the modification or construction of any facility which has the potential* to emit one ton or more per year of VOCs. A simple switch to a different chemical - or "drop in" substitution involving no equipment or process change - is considered a "modification" and is subject to this requirement.

  - the requirement to file "source registration forms" detailing the nature of the products the firm produces, and the nature and amounts of the air emissions generated if VOC emissions are more than 10 tons potential per year.

  - the requirement for facilities meeting a threshold amount of 10 tons potential air emissions to obtain operating permits to comply with Title V of the federal Clean Air Act. Companies with the potential to emit 10 tons per year of TCE, perc, or methylene chloride will be required to file for an operating permit. Annual fees in addition to five-year permit filing fees may be assessed.

  - the requirement for facilities with the potential to emit 10 tons per year of VOCs to install "reasonably available control technology" or "RACT." The technology

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* In general, "potential to emit" or "emissions potential" means the maximum capacity of a facility or a stationary source to emit any air contaminant or pollutant under its physical and operational design. Limits on emissions, such as by air pollution control equipment and/or reduced hours of operation, may be considered in potential emissions under certain circumstances. For a more detailed explanation, see Massachusetts regulations 310 CMR 7.02 (4) (a).

standards cover design and operation of degreasing equipment and nuances of the process, as well as design and operations of other manufacturing processes.

- **Wastewater Regulations** If your company's wastewater discharges directly to a surface water, you may have to modify your National Pollution Discharge Elimination System (NPDES) discharge permit. If you have a permit to discharge to the ground, such as through a septic system, the modification of your process may affect your ability to maintain this permit. If you are discharging to a publicly owned treatment works (POTW), you may be required to submit analyses of total toxic organics. You will have to submit a hazardous waste generation notification to the POTW if you now begin using a new chemical that is a hazardous waste when discarded. The POTW may then inspect the new process and analyze the effluent to make sure that the company is remaining within the POTW's discharge limits. If the solvent is flammable, you must observe discharge prohibitions. If a treatment plant worker is harmed by inhalation of the substance in an enclosed space, you may be liable. Check your local POTW regulations, but be aware that the state and the federal authorities also have jurisdiction. Your process modification could change your status under the state program for sewer use connections.

- **Fire Safety** The state fire marshal and the local fire department have authority over

Common synonyms for TCA, TCE, perchloroethylene, and methylene chloride

1,1,1-Trichlorethane (TCA or methyl chloroform)
Aerothene TT
CF 2
Chlorotene
Chlorothene
Chlorothene NU
Chlorothene SM
Chlorothene VG
Chlorten (6Cl)
Ethana NU
Ethane, 1,1,1-trichloro (8Cl, 9Cl)
ICI-CF 2
Inhibisol
Methylchloroform
Methyltrichloromethane
.alpha.-T
Tafclean
1,1,1-Trichlorethane
.alpha.-Trichloroethane
Trichloroethane
Trichloromethylmethane

Trichloroethylene (TCE)
Algylen
Anamenth
Chlorilen
Chlorylen
Densinfluat
Ethene, trichloro- (9Cl)
Ethinyl trichloride
Ethylene trichloride
Ethylene, trichloro- (8Cl)
Fluate
Germalgene
Narcogen
Narkosoid
Threthylen
Threthylene
Trethylene
Tri
Trichloran
Trichloren
Trichloroethene
1,1,2-Trichloroethylene
Trichloroethylene
Triclene
Trielene
Trielin
Trieline
Trilen
Trilene
Trimar
Westrosol

Dichloromethane (Methylene chloride)
Aerothene MM
Methane, dichloro- (8Cl, (9Cl)
Methylene chloride
Methylene dichloride
Narkotil
R 30
Solaesthin
Solmethine

Tetrachloroethylene (Perchloroethylene)
Ankilostin
Antisal 1
Didakene
Dilatin PT
Ethene, tetrachloro- (9Cl)
Ethylene tetrachloride
Ethylene, tetrachloro- (8Cl)
Fedal-Un
Freon 1110
Nema
Perchlorethylene
Perclene
PerSec
Tetlen
Tetracap
Tetrachlorethylene
Tetrachloroethene
1,1,2,2-Tetrachloroethene
1,1,2,2-Tetrachloroethylene
Tetraguer
Tetraleno
Tetropil

Source: Common Synonyms, EPA 560/4-91-005, January 1991

storage of flammables on site. Such regulations require proper placement, containers, and reporting. In addition, the use of flammable chemicals requires that the equipment in which they are used meets certain minimum fire safety specifications. It is very important if switching to a flammable chemical that you make sure your process equipment meets the fire safety specifications.

- **Accident Notification** Several laws, including EPCRA and Superfund, require notification in the case of spills and accidents. Failure to perform complete and timely notification after the release of reportable quantities can result in substantial penalties.

Other Important Considerations The daily inhalation of hazardous chemicals in the workplace may have health effects on employees which may not be noticeable except over a long period of time. Many solvents are known neurotoxins, and many are known or suspected carcinogens. After a certain time, people cease to notice the odor of many of these chemicals, but their exposure continues. Such routine daily exposure can result in fatigue or dizziness, and gradual diminution in health performance.

In addition to the statutory laws discussed above, harm to employees or others *may be actionable* under common law. Also, it is important to recognize the increasing imposition of criminal penalties for environmental violations, including acts and omissions that used to be considered negligence. *Don't just delegate paperwork.* Know what the hazards are, because it can directly and substantially affect the economic position of your firm.

Aside from legal and health and safety considerations, your firm should also consider the true costs of using a particular solvent or chemical. If you do not have to change your equipment for a "drop-in" substitute, that is a savings. But *be sure* to factor in the considerable costs of regulatory compliance, the cost of disposing of any hazardous waste generated by the use of that chemical, and the potential costs of increased liabilities. Include in your managerial considerations estimates of the economic benefits of eliminating hazards, paperwork, management costs, and liability risks.

Knowing the range of options open to you will keep you up to date with the rapidly evolving standard of care. It will also put you on the cutting edge of the state of the art of modern industrial practice. A practical approach to solvent substitution means taking the time to learn about new cleaning practices and technologies, whether through vendors, consultants, trade associations, business publications, colleagues, or the *Office of Technical Assistance for Toxics Use Reduction.* As you learn about process alternatives for environmental, health and safety reasons you will also learn about opportunities for increasing efficiency, productivity and profitability.

This fact sheet was prepared by the Office of Technical Assistance for Toxics Use Reduction (OTA), *a branch of the Massachusetts Executive Office of Environmental Affairs. OTA's mission is to assist industry in reducing the use of toxic substances and/or the generation of toxic manufacturing byproducts. OTA's* ***confidential*** *and* ***nonregulatory*** *services are available at* ***no charge*** *to Massachusetts businesses and institutions that use toxic chemicals. For further information about OTA's technical services, contact:* ***Office of Technical Assistance, Executive Office of Environmental Affairs, Room 2109, 100 Cambridge Street, Boston, MA 02202, (617) 727-3260.***